throughput.[22] In addition, ADFM provides for graceful, incremental network expansion, offers limited levels of service prior to full NWN implementation, supports zoning for additional capacity on the forward channel, and, to some extent, allows deployment of additional receivers to accommodate long term growth on the reverse channel. Finally, and importantly, ADFM techniques allow Mtel to increase the network's speed by upgrading the processing system as the price of computing power decreases.

Mtel has invested significant time and resources to develop the techniques necessary to integrate the various aspects of ADFM. In addition to Mtel's own extensive resources, Mtel also has underwritten the research of Dr. Rade Petrovic at the University of Mississippi's Center for Telecommunications Research to develop the multiple access protocols and dynamic scheduling algorithms used in the NWN service. Mtel concurrently is reviewing the patentability of several of the ADFM techniques.

ADFM offers a singular degree of control over network resources, resulting in substantial benefits for NWN users. The system is innovative, highly transparent, adaptable, and extremely efficient. ADFM methodology substantially enhances the functionality of NWN by allowing adaptation to loading variations and growth. For these reasons, Mtel believes ADFM method warrants a pioneer's preference under the criteria enumerated in the Commission's *Pioneer Preference Order*.

---

[22] For additional information on the contemplated protocols for Mtel's NWN system, see Appendix A to Mtel's *NWN Petition*.

IV. MTEL DESERVES A NATIONWIDE PREFERENCE BECAUSE THE NWN SERVICE IS INHERENTLY NATIONWIDE IN SCOPE

NWN is designed as a nationwide service and a pioneer's preference should be awarded to Mtel for a nationwide license. In the *Pioneer Preference Order*, the Commission indicated that it would consider granting such nationwide preferences "[w]here a service is inherently nationwide."[23] NWN fits the Commission's criteria, since attempting to license NWN providers on anything less than a nationwide scale will be attended with severe penalties in the utility of the service. Accordingly, Mtel requests the Commission to grant it a nationwide pioneer's preference.

As an initial matter, the utility of nationwide services has been recognized by both the Commission and the consumer public. In both the proceeding to allocate the 220-222 MHz band for narrowband private land mobile providers and the proceeding to allocate 931-932 MHz for common carrier paging providers, the Commission reserved channels exclusively for nationwide service.[24] Industry estimates, in addition, place the demand for nationwide paging at 870,000 subscribers by 1995.[25] Like the

---

[23] *Pioneer's Preference Order*, 6 FCC Rcd at 3495.

[24] *See Amendment of Part 90 of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Services*, 3 FCC Rcd 5287 (1988), *recon. denied*, 4 FCC Rcd 6407, 6408 (1989); *Amendment of Parts 2 and 22 of the Commission's Rules to Allocate Spectrum in the 928-941 MHz Band and to Establish Other Rules, Policies, and Procedures for One-Way Paging Stations in the Domestic Public Land Mobile Radio Service*, First Report and Order, 89 F.C.C.2d 1337 (1982).

[25] Donaldson, Lufkin & Jenrette, Company Analysis of Mobile Telecommunication Technologies, June 19, 1990, at 5.

services in place in the 931 MHz band and those to be licensed in the 220 MHz band, Mtel's NWN system has been designed as a practical means to meet nationwide needs.

NWN service cannot feasibly be provided on less than a nationwide basis since imposing geographical constraints will create vast areas between carriers that cannot be served. Unlike licenses in the cellular radiotelephone service, adjacent NWN carriers would not have flexibility to alter frequency plans to accommodate other providers on the same frequency block within a "coordination contour," much less the ability to deal with service contour overlap. Moreover, due to the simplex operation of NWN systems, the exclusion zone between service will be vast if nationwide service is not available. NWN relies upon a dynamic time division scheme to accommodate both forward and reverse channel operation within the same 50 kHz channel. The forward channel operates as a network of wide area, high power (3500 Watt ERP) simulcast transmitters. The reverse channel network, in contrast, is a dense array of highly sensitive receivers designed to capture low power (7 Watt ERP) user terminal transmissions. Thus, if an adjacent co-channel system were in the forward subcycle while a neighboring system was in the reverse subcycle,[26] the base stations would completely saturate the receiver network unless exorbitant separation criteria were

---

[26] In theory, adjacent systems could coordinate forward and reverse channel timing, but such coordination would have other effects on NWN service. For example, the ADFM scheme would have to coordinate between two providers to alter the forward and reverse channel time mix, with impacts on the ability of the system to accommodate variations in traffic loading. As NWN becomes more mature, daisy chained adjacencies would require a single, national standard for timing as more and more systems were coordinated.

adopted.[27] Any areas in the separation zone, of course, would be unable to obtain NWN service.

Were coordination to be mandated between adjacent carriers, any geographical division of NWN service would still create "edge effects" that would disrupt operation due to the complexity of NWN scheduling.[28] Even if forward and reverse channel timing could be locked to a standard, any user terminal in the interference zone between adjacent transmitters would nevertheless receive a signal that is a composite of the closest transmitters, a signal that would be indecipherable.[29] Similar problems would occur for reverse channel transmissions. A user terminal data transfer from an interference zone might or might not be captured by a receiver managed by the terminal's home system, and therefore adjacent providers would be required to exchange data to coordinate reverse channel transmissions. In effect, adjacent providers would be required to agree on a protocol that describes the most basic level

---

[27] In the cellular service for base stations at 500 feet HAAT or less, where transmitters are limited to 500 Watts ERP at 500 feet HAAT, the coordination contour is 75 miles. *See* 47 C.F.R. § 22.905 (1991). For NWN service, where transmitters can utilize up to 3500 Watts ERP, the distance obviously would be much greater at the higher antenna heights.

[28] "Edge effects" would exist along and on either side of system boundaries. The main effect would be interference over a large geographic area.

[29] In a nationwide NWN system, users in interference areas between zones -- thus receiving multiple zonal data transmissions -- are still capable of receiving data in nationwide data blocks, which are simulcast everywhere.

of NWN operation, a potentially insurmountable task as coverage expands and adjacencies are daisy chained together.[30]

Furthermore, Mtel's NWN system relies heavily upon its capability to identify the location of any particular user terminal through use of nationwide time slots in the simulcast. If Mtel were unable to locate users with a high degree of certainty due to edge effects and the existence of multiple regional providers, NWN's ability to zone for additional capacity would be severely hindered and Mtel would be unable to rely upon acknowledgements as a form of registration. As a consequence, NWN would be required to utilize alternative forms of identifying the location of user terminals, significantly increasing the volume of unsolicited terminal initiated traffic -- packets that are unscheduled and must rely upon contention intervals for access to system resources.

NWN has been designed as a nationwide system. Seamless compatibility could not be realized if providers were licensed on a wide area or regional basis, much less if licenses were granted for individual metropolitan areas. Any boundaries will create immense exclusion zones or require a massive coordination effort between adjacent systems. The degree of computing power required by the system and the intelligence within the system are fundamental to NWN. Absent common operational control, it is highly unlikely that any two licensees will be able to create systems that will

---

[30] Due to the simulcast nature of NWN, a system between two NWN systems cannot be coordinated with both adjacent systems unless all three operate on the same schedule. As NWN service approaches nationwide seamless coverage, all NWN providers would be required to synchronize operations.

compatibly interchange terminal tracking information, simulcasting synchronization data, zoning data, forward and reverse channel time allocation data, and the myriad of other data necessary to integrate multiple NWN systems on a functional level. Without compatibility at this basic level, no jointly operated NWN system could operate at the speed necessary to achieve the efficiencies that are the cornerstone of NWN.

V. CONCLUSION

Mtel should be granted a nationwide pioneer's preference for the NWN service. Mtel's NWN service is a specific and detailed blueprint for the future of wireless messaging services incorporating many innovative technologies to significantly enhance and increase the utility of current messaging systems. NWN provides full two-way messaging functionality and economic, spectrum efficient data transfer capabilities on a scale heretofore unknown. Mtel's NWN system also incorporates important advances in the state-of-the-art of messaging services that include:

- An enhanced multitone modulation simulcast system operating at ten times the speed of existing systems in an equivalent amount of spectrum.
- An advanced dynamic frequency management plan that incorporates a forward and reverse channel re-use, an efficient scheduling system, graceful evolutionary capability, and a high degree of system flexibility.

Mtel's efforts in developing the NWN service and the associated technology to implement NWN are pioneering achievements that should be recognized and rewarded with a licensing preference. Since NWN must be implemented as an integrated and

interconnected nationwide system, the appropriate geographic scope of the preference should be nationwide. Accordingly, Mtel respectfully requests the Commission to award it a nationwide pioneer's preference for the NWN service.

Respectfully submitted,

MOBILE TELECOMMUNICATION
TECHNOLOGIES CORPORATION

By: Richard E. Wiley

Richard E. Wiley
R. Michael Senkowski
David E. Hilliard
Eric W. DeSilva
of
WILEY, REIN & FIELDING
1776 K Street, N.W.
Washington, D.C. 20005
(202) 429-7000

Its Attorneys.

Dated: November 12, 1991